Sustainability assessment of stormwater management systems

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Summary

We quantify ecotoxicity impacts caused by different solutions to manage stormwater using life cycle assessment. As a novelty, we include emissions of a wide range of pollutants present in runoff. These emissions turn out to be of great importance, especially in decentralized, above surface systems.

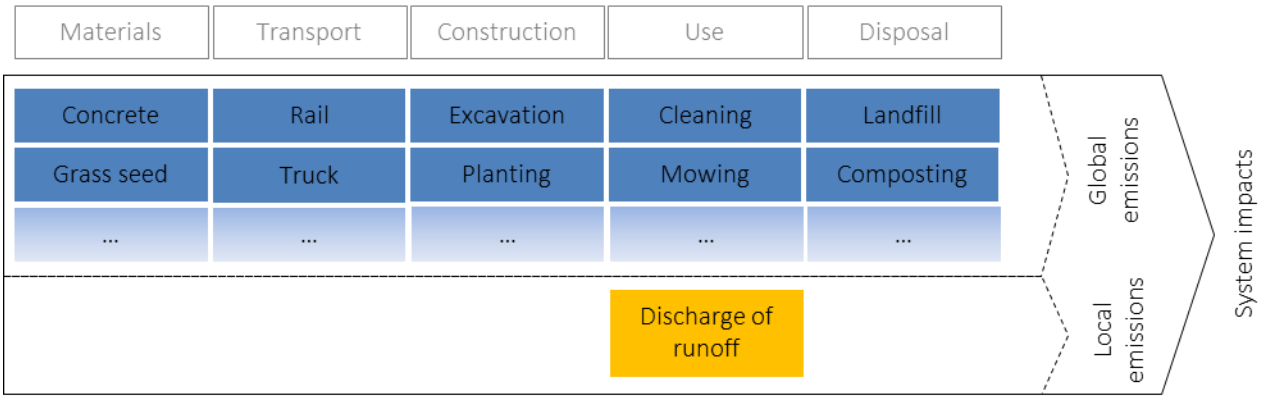
Abstract

We use life cycle assessment to quantify the environmental sustainability of stormwater management systems. All relevant processes related to implementation, maintenance, and end of life of the installations are included, causing non-location specific, “global” emissions. As a novelty, we develop a systematic approach to include local emissions from discharge of runoff during the use stage of the system.

We determine the average potential ecotoxicity impact per litre of runoff discharged to the environment. Mean concentrations are estimated for a large number of pollutants potentially present in runoff based on a wide range of measurement data found in literature. Local emissions of heavy metals contribute most to the ecotoxicity impact.

The relative importance of local emissions depends on the system approach. In decentralized systems that mainly utilize above surface structures, local emissions contribute significantly to the impacts when no treatment is in place. In the case of centralized, subsurface systems the total impacts are higher, even though metal removal in central wastewater treatment plants leads to lower contributions from local emissions.

System boundaries of the assessment



Ecotoxicology impacts of different stormwater management systems